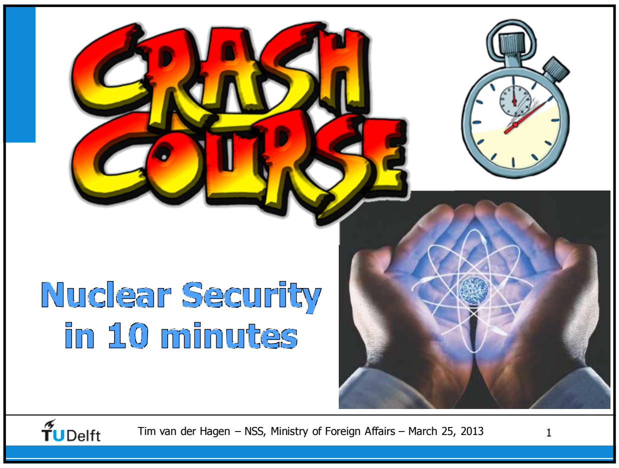
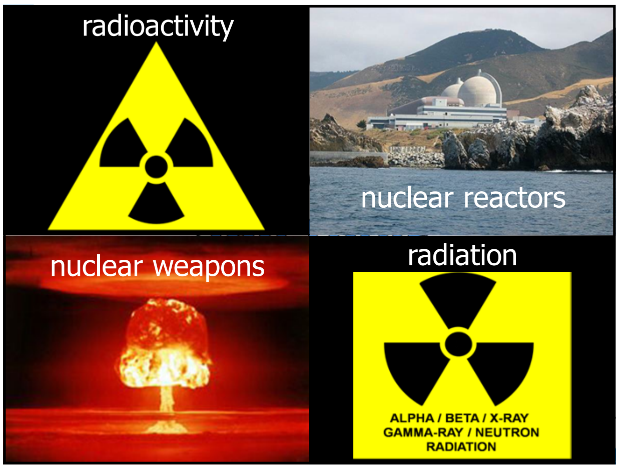


CRASH COURSE

Nuclear Security in 10 minutes



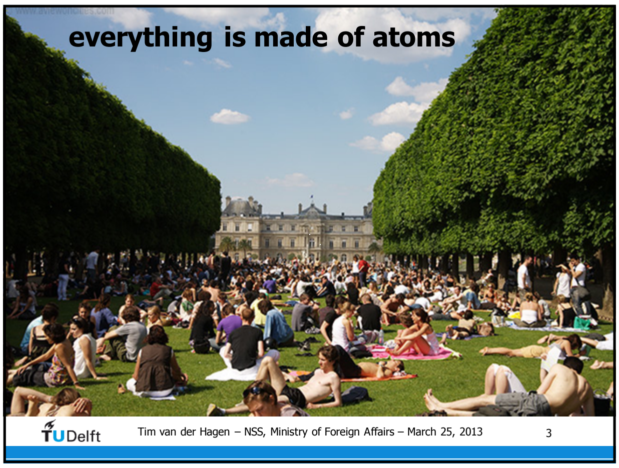
radioactivity

nuclear reactors

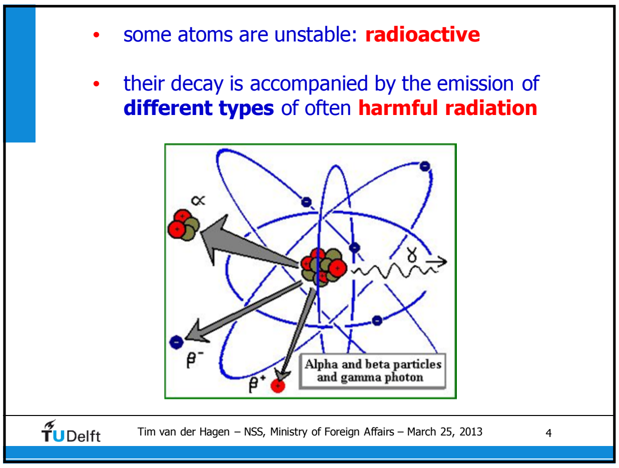
nuclear weapons

radiation

ALPHA / BETA / X-RAY
GAMMA-RAY / NEUTRON
RADIATION

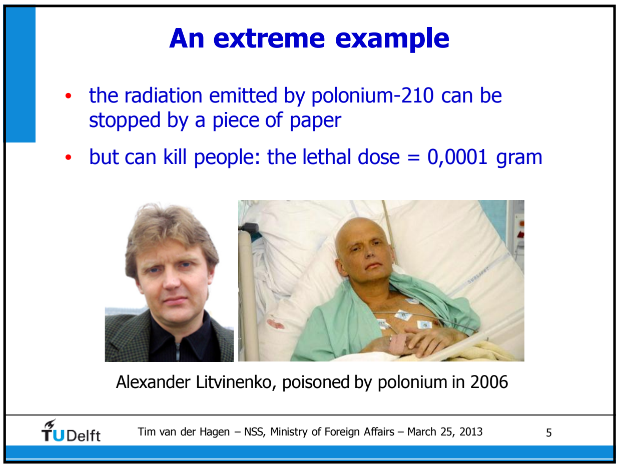


everything is made of atoms



- some atoms are unstable: **radioactive**
- their decay is accompanied by the emission of **different types** of often **harmful radiation**

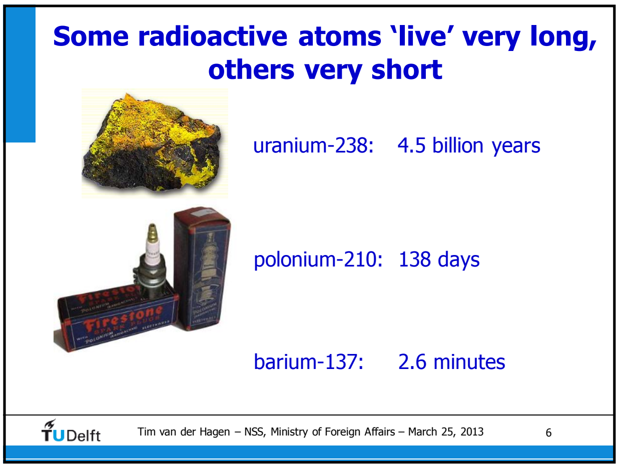
α
γ
β^-
β^+
Alpha and beta particles and gamma photon



An extreme example

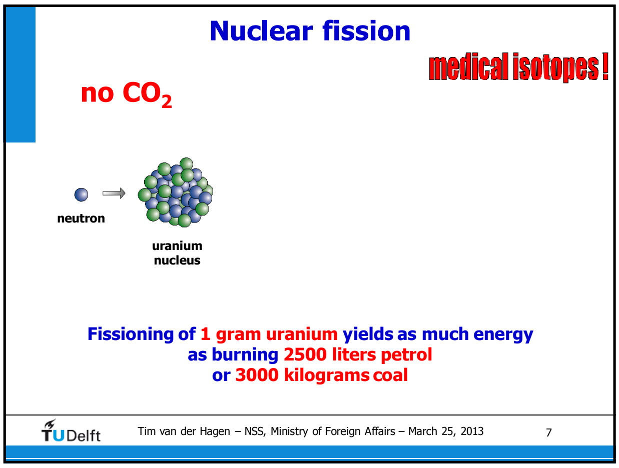
- the radiation emitted by polonium-210 can be stopped by a piece of paper
- but can kill people: the lethal dose = 0,0001 gram

Alexander Litvinenko, poisoned by polonium in 2006



Some radioactive atoms 'live' very long, others very short

uranium-238:	4.5 billion years
polonium-210:	138 days
barium-137:	2.6 minutes



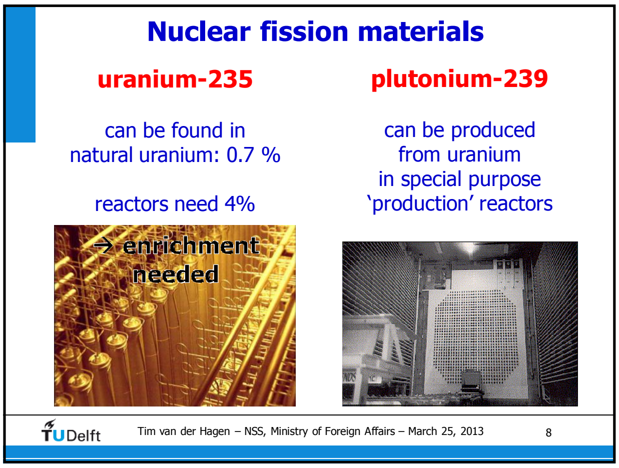
Nuclear fission

medical isotopes!

no CO_2

neutron
uranium nucleus

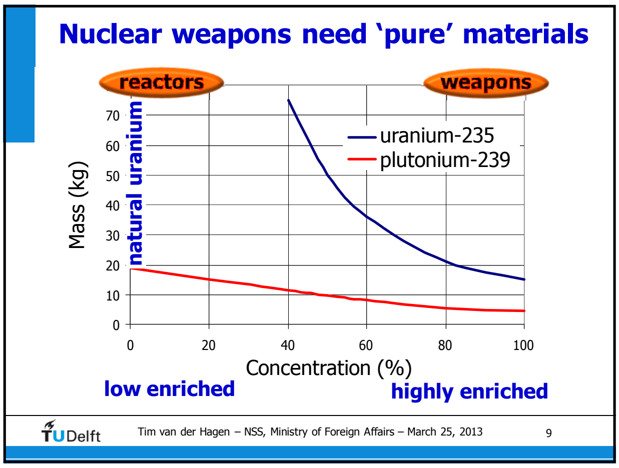
Fissioning of 1 gram uranium yields as much energy as burning 2500 liters petrol or 3000 kilograms coal



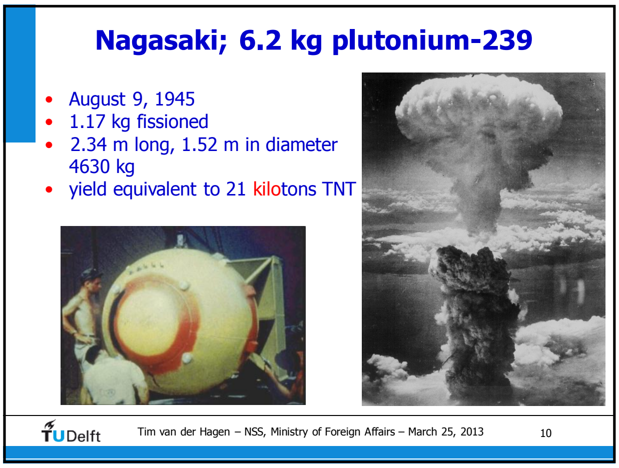
Nuclear fission materials

uranium-235	**plutonium-239**
can be found in natural uranium: 0.7 %	can be produced from uranium in special purpose 'production' reactors
reactors need 4%	

→ enrichment needed

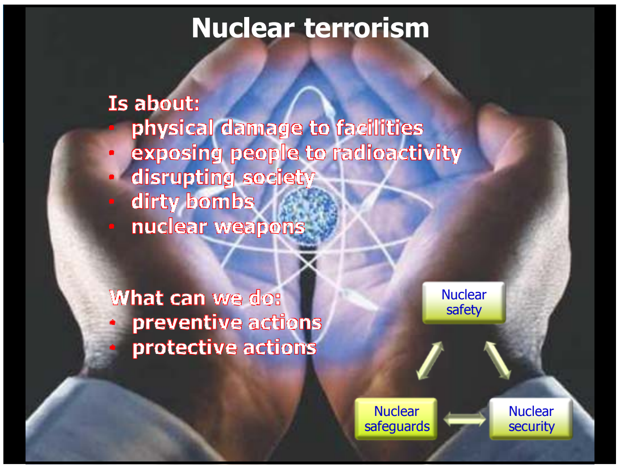


Nuclear weapons need 'pure' materials



Nagasaki; 6.2 kg plutonium-239

- August 9, 1945
- 1.17 kg fissioned
- 2.34 m long, 1.52 m in diameter 4630 kg
- yield equivalent to 21 kilotons TNT

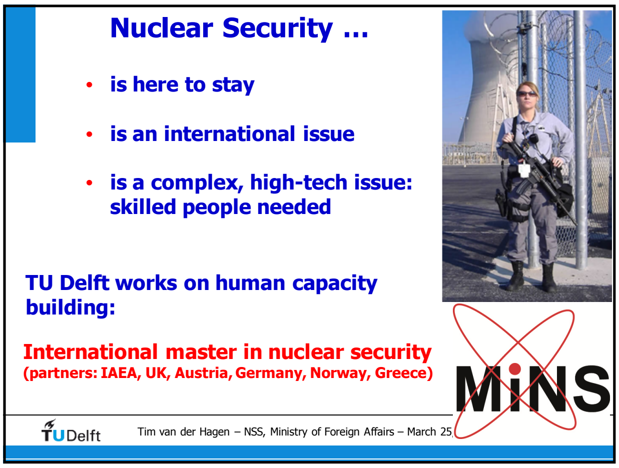


Nuclear terrorism

Is about:
- physical damage to facilities
- exposing people to radioactivity
- disrupting society
- dirty bombs
- nuclear weapons

What can we do:
- preventive actions
- protective actions

Nuclear safety
Nuclear safeguards
Nuclear security



Nuclear Security ...

- **is here to stay**
- **is an international issue**
- **is a complex, high-tech issue: skilled people needed**

TU Delft works on human capacity building:

International master in nuclear security
(partners: IAEA, UK, Austria, Germany, Norway, Greece)